ARTIFICIAL VASCULAR GRAFTING ASSOCIATED WITH TUMOR EXTIRPATION

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Improvement of the artificial vascular grafting material using synthetic fibers has facilitated ready application of artificial grafts in the reconstructive surgery of blood vessels.

The surgical application of the vessel substitutes finds its valuable place in resection of aneurysm, repair of injured blood vessels, or bypass grafting of the vessels, and further in the vascular transplantation associated with the extirpation of malignant tumors.

When a tumor was tightly adherent to, or infiltrating the great vessels, total extirpation of the tumor together with the involved blood vessel and reconstruction of the vascular continuity using the artificial vascular substitutes, had been the limited choice until the synthetic vascular grafts became available.

Using the Tetoron arterial grafts, provided in Japan, six cases of reconstructive vascular surgery were carried out in which large blood vessels were excised together with malignant tumors and the continuity of the vessels was reestablished.

REPORT OF CASES

Case 1. C. A., 49-year-old female.

Chief complaint: Attack of severe pain in the right lower abdomen and the right thigh.

History: The patient first noticed pain in the lower abdomen about seven years ago. The pain gradually became more intensive. Four years ago, a tumor was found in the right lower abdomen and laparotomy was performed. At that time a tumor was found adjacent to the right common iliac artery and a part of the tumor was excised. Two years ago, a similar operation was again performed.

Local findings: A fixed tumor was palpated in the ileocecal region. No circulatory disturbance was noted.

Operative findings: The tumor was the size of a fist and involved the right common iliac artery, the internal and the external iliac arteries and the right ureter. As it was impossible to free the tumor from these organs, all

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involved organs were excised together with the tumor and the Tetoron arterial graft was used to bridge the defect of the arteries. The veins and the ureter were ligated (Fig. 1).

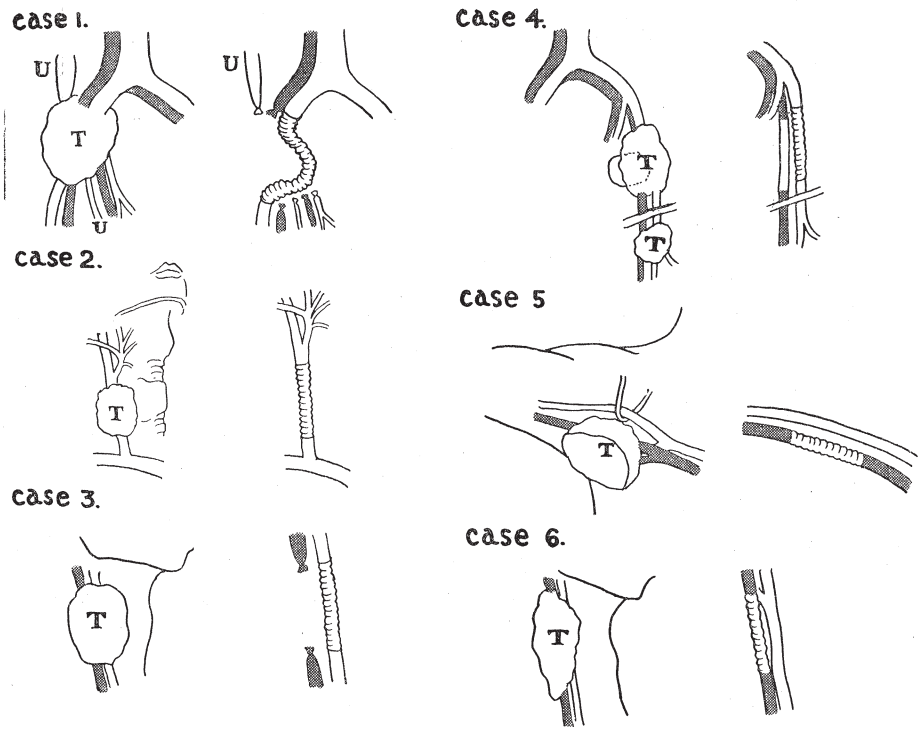

FIG. 1. Diagrams of transplantation of the artificial vascular graft on each case.
T: Tumor; U: Ureter;

Pathological findings: Leiomyosarcoma.

Postoperative course: The aortogram showed a satisfactorily functioning artificial graft (Fig. 2) and the postoperative course was uneventful up until six months after the operation when patient was readmitted with the diagnosis of ileus and was laparotomized. The artificial graft was tortuous according to its length which was slightly longer than adequate, and a portion of the ileum was adherent to the posterior abdominal wall, which was duely corrected. Otherwise there was no adhesion around the intestinal wall, the omentum and the graft. The patient has been leading a normal life, assisted by radiation therapy, for four years after the operation.

Case 2. M. U., 48-year-old male.

Chief complaint: Swelling of the right side of the neck.

History: Five months prior to the admission, the patient noticed a tumor

on the right side of the neck. Surgical approach was attempted and only partial resection was carried out due to the adhesion between the tumor and the right common carotid artery. One month after the operation, again a tumor was noted on the site of the above operation and the pain became gradually severe.

Local findings: Under the operative scar running along the right sternocleidomastoid muscle, there was a hard, fixed tumor measuring about five centimeters in diameter. Under the left mandible, there were several swollen lymphnodes palpable.

Operative findings: The tumor was tightly adherent to the right sternocleidomastoid muscle and to the skin. These were freed by sharp dissection. The right superficial jugular vein and the tumor were excised, also together with the right two-third of the thyroid gland and the right common carotid artery. The defect of the right common carotid artery was repaired with artificial graft (Fig. 1, and Fig. 3).

Pathological findings: Carcionoma of the thyroid gland, small cell type.

Postoperative course: Five weeks after the operation, an arteriogram was taken and it was found that blood flowed through freely. Nine months after the operation, the patient died because of the recurrence of the tumor.

Case 3. C. O., 64-year-old male.

Chief complaint: Tumor of the right side of the neck.

History: About two months prior to the admission, a small-finger-tip sized tumor was found on the right side of the neck by the patient. No pain was experienced. Surgical removal of the tumor was attempted elsewhere but only the partial resection was possible owing to the tight adhesion of the tumor to the right common carotid artery. The tumor gradually increased in its size.

Local findings: On the right side of the neck, there was a tumor measuring six by six centimeters and it was adherent to the surrounding tissue.

Operative findings: The size of the tumor itself was about five by five centimeters and it was impossible to free the tumor from the right common carotid artery and the right jugular vein. The both vessels were ligated and removed together with the tumor. The right external carotid artery was ligated and then the continuity between the right internal carotid artery and the right common carotid artery was reestablished using the Tetoron arterial graft (Fig. 1).

Pathological findings: Squamous cell carcinoma.

Postoperative course: Deep X-ray treatment was applied to the right side of the neck. Sixty days after the operation the patient was discharged from the hospital. But the patient died of metastasis to lung in the fourth month postoperatively.

Case 4. K. Y., 31-year-old female.

Chief cmplaint: Swelling of the left leg.

History: The patient noticed pain in the left knee about one and a half

years ago and noticed swelling of the left leg about a year ago. Walking made the swelling more pronounced. In the last six months the swelling became persistent even at resting and it was also noticed in the left thigh.

Local findings: The anterior portion of the left tibia was edematous and there was thumb tip sized swollen lymphnode in the left groin. The phlebogram showed the obstruction of the left pelvic veins.

Operative findings: The tumors, one measuring about five centimeters in diameter and the other about four, surrounded the left external iliac artery and vein. The artery was patent while the vein obstructed. The tumors were excised together with the adherent vessels. The continuity of the artery was reestablished using the Tetoron arterial graft and the continuity of the vein using a tube-formed Ivalon sheet (Fig. 1).

Pathological findings: Angioblastoma.

Postoperative course: The angiogram taken one month after the operation showed that the vein was obstructed while the artery remained satisfactorily patent (Fig. 4). The edema of the left leg did not disappear but only slight difficulty at walking was experienced.

Case 5. Y. Y., 27-year-old male.

Chief complaint: Tumor in the right axillar cavity.

Histroy: A tumor of the size of a table tennis ball was found by the patient about two months prior to the admission.

There was no pain or functional impairment at that time. Lately, the tumor increased in size with increasing severity of pain, up to the point where sleep was disturbed.

Local findings: A tumor measuring about five centimeters in diameter was located between the right axillar cavity and the anterior chest wall (Fig. 1). The skin over the tumor was eroded and surrounded by hard pigmented skin. No circulatory disturbance was noted in the right arm.

Operative findings: An attempt was made to remove the tumor together with the skin. The tumor was free from the axillary artery but it was impossible to sever the tumor from the axillary vein. Therefore, the tumor was excised together with the axillary vein and the venous continuity was secured by the transplantation of a Tetoron graft.

Pathological findings: Liposarcoma.

Postoperative course: The venogram taken fourty eight hours after the operation (Fig. 5) showed a functioning graft, but that of one week after the operation showed only some collateral channels and no functioning graft (Fig. 6). No edema of functional impairment developed in the right arm.

Case 6. T. M., 52-year-old male.

Chief complaint: Tumor on the right side of the neck.

History: The patient noticed swelling of the right cheek about six months ago, which was diagnosed as cancer of the right mandible, and an excisional operation was performed with uneventful postoperative course. The patient

again noticed a tumor on the right side of the neck about a month ago. Since then the tumor increased in its size.

Local findings: The tumor on the right side of the neck, measuring about four centimeters in diameter, was hard in consistency, adherent to the surroundings, and tender.

Operative findings: The tumor was successfully freed from the right common carotid artery but not from the right jugular vein. A portion of the right jugular vein, in the length of about eight centimeters was excised together with the tumor. The defect of the vein was reconstructed using the artificial graft (Fig. 1).

Pathological findings: Metastasis of the cancer to the lymphnode.

Postoperative course: No venogram was taken. Two months after the operation the general condition of the patient gradually deteriorated and the patient expired.

DISCUSSION

Transplantation of the artificial vascular grafts was performed on the six cases as shown in table 1. Of these, attempts had been made to remove the

TABLE 1

Case No.	Age	Sex	Grafting site	Graft		Arterial occlusion time in operation	Pathology	Postoperative course
				Length (cm)	Dia. (cm)	(min)		
1	49	F	Right common iliac artery to right external iliac artery	12	0·8	40	Leiomyo-sarcoma	Patent, after four years
2	48	M	Right common carotid artery	8	0.6	30	Carcinoma of thyroid. Small cell type	Patent, but died of metastasis ninth month postoperatively
3	64	M	Right common carotid artery to right internal carotid artery	8	0.6	32	Souamous cell carcinoma	Patent, but died of metastasis to lung fourth month post-operatively
4	31	F	Left external iliac artery and vein	a-9.5 v-10	0.5 0.6	26 28	Angio-blastoma	Arterial graft patent, after four years. Vein graft obstructed at discharge
5	27	M	Right axillary vein	7	0.6	40	Lipo-sarcoma	Vein graft obstructed one week after operation
6	52	M	Right jugular vein	8	0.7	35	Metastatic carcinoma to lymph-nodes	Obstructed. Expired after two months

tumors on cases 1, 2, 3 and 6 at hospitals elsewhere and partial removal of the tumors had only been carried out, thus making the patients seek for futher medical care in our clinic.

On the four cases out of six artificial grafting was performed and all of these were successful.

On the other hand, artificial venous grafting was performed on the three cases, one of them using an Ivalon tube. Though sufficient venous flow was evidenced by the venogram taken fourty eight hours after the operation in Case 4, the venograms taken two weeks after the operation on these three cases showed nonfunctioning venous grafts.

In view of the results of this series, artificial venous grafting on these cases is not an absolute indication. Considering that the venous transplantation itself has little choice of success, further investigation is yet to be carried out in the field as to grafting materials, operative technique and suturing maneuver and other problems.

Despite of the presence of many urgent problems yet to be solved, artificial vascular grafting has helped to make the extirpation of malignant tumors much easier and more complete, thus further prolonging the patient's life.

CONCLUSION

Six cases, in which malignant tnmors were infiltrating main blood vessels, have been treated surgically and the tumors were excised together with the invaded blood vessels, and the blood stream was reestablished with the artificial grafts.

Of these six cases, four were that of the arterial grafting and all of these had satisfactory results without peripheral circulatory disturbances.

Three cases out of these six had their veins reconstructed using synthetic grafts, but the veins were obstructed shortly after the operation.

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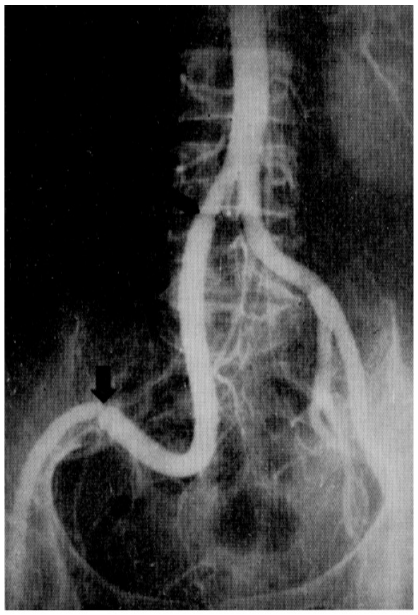

FIG. 2

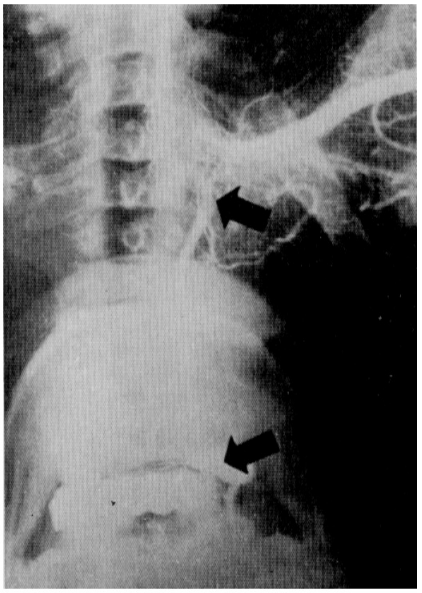

FIG. 3

FIG. 2. Case 1. Aortogram taken five weeks after operation. Blood stream is well maintained.

FIG. 3. Case 2. Transplantation of the Tetoron artificial graft to the right common carotid artery.

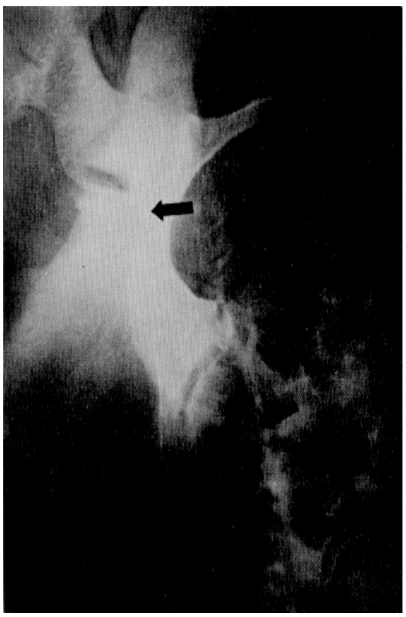

FIG. 4. Case 4. Aorftogram taken one month after the grafting for the left external iliac artery. Blood stream is well maintained.

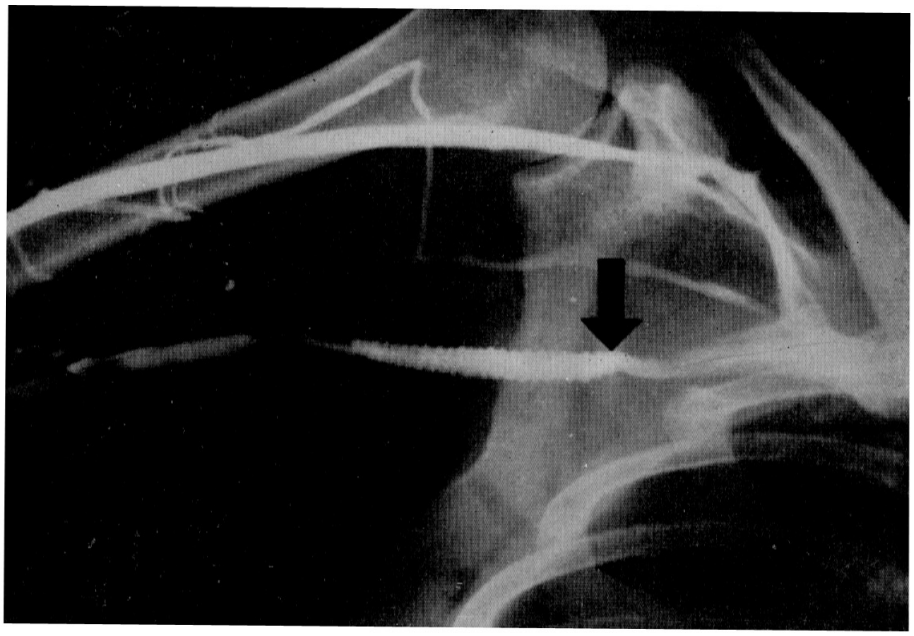

FIG. 5. Case 5. Venogram taken fourty-eight hours after the operation. The graft is patent.

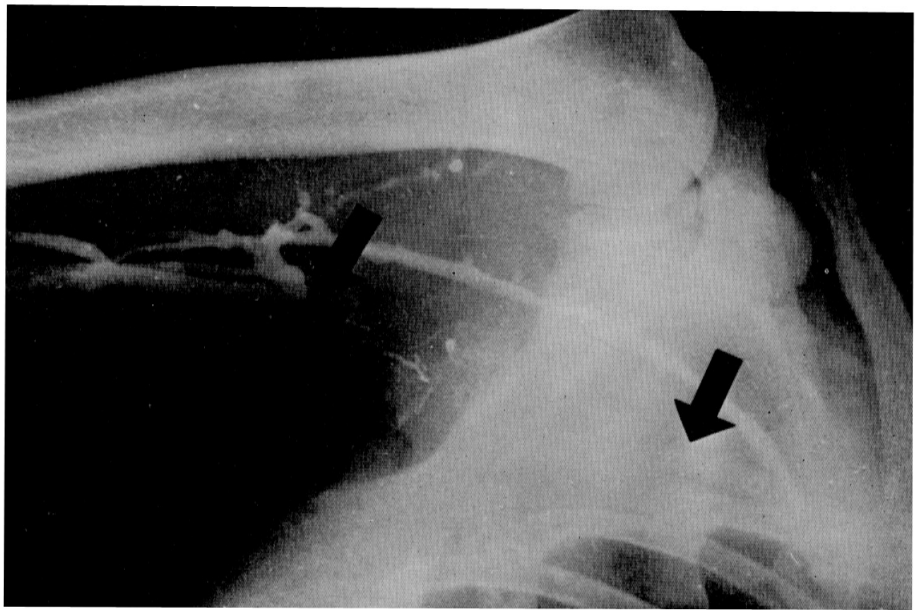

FIG. 6. Case 5. One week after the operation. Collateral veins are developing. The graft is occluded (between two arrows).